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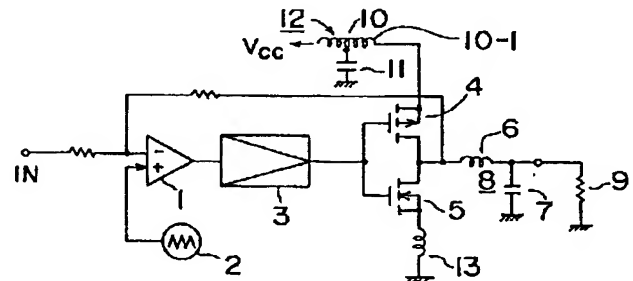
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(54) 【発明の名称】 増幅器

(57) 【要約】

【目的】 実装上不利にならないように、出力増幅素子の貫通電流制限するための回路を設けた増幅器を提供する。

【構成】 出力増幅段にコンプリメンタリプッシュプル接続のトランジスタを備え、入力アナログ信号のレベルに基づくオン・オフ信号によって前記トランジスタを駆動する増幅器において、PチャンネルMOSFET 4のソースに接続されてPチャンネルMOSFET 4のソースに電源電圧を供給する電源ラインフィルタ 12を構成するコイル 10に中間タップを設け、前記電源ラインフィルタ 12を構成するコンデンサ 11を前記中間タップとアースとの間に接続し、NチャンネルFET MOS 5のソースをアースに接続するライン中にコイル 13を接続した。



【0008】本発明の請求項2の増幅器は、出力増幅段にコンプリメンタリプッシュプル接続のトランジスタを備え、入力アナログ信号のレベルに基づくオン・オフ信号によって前記トランジスタを駆動する増幅器において、正極性、負極性の各電源の電源ラインに各別に接続されて前記トランジスタの夫々に電源電圧を供給する電源ラインフィルタを構成するコイルに中間タップを設け、該中間タップとアースとの間に接続されるコンデンサとを備えたことを特徴とする。

【0009】本発明の請求項3の増幅器は、出力増幅段にコンプリメンタリプッシュプル接続のトランジスタを備え、入力アナログ信号のレベルに基づくオン・オフ信号によって前記トランジスタを駆動する増幅器において、前記トランジスタ中の電源側のトランジスタと該電源側のトランジスタの電源ラインとの間に接続した第1のコイルと、前記トランジスタ中のアース側のトランジスタと該アース側のトランジスタのグランドラインとの間に接続した第2のコイルとを備えたことを特徴とする。

【0010】

【作用】本発明の請求項1の増幅器は、電源側のトランジスタに電源電圧を供給する電源ラインフィルタを構成するコイルが、またアース側のトランジスタをアースに接続するライン中に接続したインダクティブ素子が両トランジスタの貫通電流を制限することになって、貫通電流による破損から両トランジスタが保護される。さらに、電源ラインフィルタを構成するコイルおよびインダクティブ素子が両トランジスタの中間に位置するわけではないため、電源ラインフィルタを構成するコイルおよびインダクティブ素子は電源ライン、アースラインの任意の位置で実装できることになって、トランジスタの出力ラインを延ばす必要はなくなり、不要輻射などの悪影響が無くなる。

【0011】本発明の請求項2の増幅器は、電源側およびアース側のトランジスタに電源電圧を供給する電源ラインフィルタを構成するコイルが両トランジスタの貫通電流を制限することになって、貫通電流による破損から両トランジスタが保護される。さらに、電源ラインフィルタを構成するコイルが両トランジスタの中間に位置するわけではないため、電源ラインフィルタを構成するコイルは電源ラインの任意の位置で実装できることになって、トランジスタの出力ラインを延ばす必要はなくなり、不要輻射などの悪影響が無くなる。

【0012】本発明の請求項3の増幅器は、第1および第2のコイルが両トランジスタの貫通電流を制限することになって、貫通電流による破損から両トランジスタが保護される。さらに、第1および第2のコイルが両トランジスタの中間に位置するわけではないため、第1、第2のコイルは電源ライン、アースラインの任意の位置で実装できることになって、トランジスタの出力ラインを

延ばす必要はなくなり、不要輻射などの悪影響が無くなる。

【0013】

【実施例】以下、本発明を実施例により説明する。図1は本発明にかかる増幅器の第1実施例の構成を示すブロック図であり、パルス幅変調増幅器の場合を例示している。

【0014】第1実施例の増幅器は正極性電圧を用いた場合の例であって、コンプリメンタリプッシュプル接続されたトランジスタの電源側のトランジスタであるPチャンネルMOSFET4のソースには正極性の電源電圧Vccを供給し、コンプリメンタリプッシュプル接続されたトランジスタのアース側のトランジスタであるNチャンネルMOSFET5のソースはアースする。第1実施例の増幅器において、比較器1、三角波発振器2、駆動増幅器3、MOSFET4および5、コイル6、コンデンサ7、ローパスフィルタ8、負荷9は、図4に示した従来例の同一符合の部分を示すものであって、これらの説明は省略する。

【0015】第1実施例の増幅器においては、PチャンネルMOSFET4のソースに電源ラインに重畳されたノイズを除去するために、コイル10とコンデンサ11とからなる電源ラインフィルタ12が直列に接続してあって、電源ラインフィルタ12を通して電源電圧VccをPチャンネルMOSFET4のソースに供給する。電源ラインフィルタ12は、コイル10に中間タップが設けてあり、コンデンサ11を介してコイル10の中間タップをアースしてある。さらに、NチャンネルMOSFET5のソースには直列にコイル13が接続してあって、コイル13を介してNチャンネルMOSFET5のソースをアースしてある。

【0016】上記のように構成した第1実施例の増幅器によれば、電源ラインフィルタ12によって電源ラインのノイズが除去され、ノイズが除去された電源電圧がPチャンネルMOSFET4のソースに印加される。さらに、PチャンネルMOSFET4およびNチャンネルMOSFET5が共にオン状態になったときに、コイル10および13のインピーダンスによって、PチャンネルMOSFET4およびNチャンネルMOSFET5を貫通して流れる電流が制限され、PチャンネルMOSFET4およびNチャンネルMOSFET5が破壊から保護され、かつ効率の低下が防止される。さらに、この場合にコンデンサ11の電荷の放電による短通電流はコイル10の中間タップからPチャンネルMOSFET4のソース側のコイル10-1および13のインピーダンスによって制限されることになる。

【0017】また、増幅器においては、通常、電源ラインフィルタが接続されているのが普通であって、第1実施例の増幅器によるときは、通常接続されている電源ラインフィルタを利用しているため、電源ラインフィルタ

バイポーラトランジスタであっても同様に構成することができる。

【0029】上記においてパルス幅変調増幅器の例で説明したが、パルス搬送波の単位時間あたりのパルス密度が入力アナログ信号のレベルによって変調される形式のパルス数変調増幅器の場合でも同様に構成できる。

【0030】

【発明の効果】以上説明した如く本発明の請求項1の増幅器によれば、電源側のトランジスタに電源電圧を供給する電源ラインフィルタを構成するコイルが、またアース側のトランジスタをアースに接続するライン中に接続したインダクティブ素子が両トランジスタの貫通電流を制限することになって、貫通電流による破損から両トランジスタが保護されると共に、電源ラインフィルタを構成するコイルおよびインダクティブ素子が両トランジスタの中間に位置するわけではないため、電源ラインフィルタを構成するコイルおよびインダクティブ素子は電源ライン、アースラインの任意の位置に実装できることになって、トランジスタの出力ラインを延ばす必要はなくなり、不要輻射などの悪影響が無くなるという効果がある。

【0031】以上説明した如く本発明の請求項2の増幅器によれば、電源側およびアース側のトランジスタに電源電圧を供給する電源ラインフィルタを構成するコイルが両トランジスタの貫通電流を制限することになって、貫通電流による破損から両トランジスタが保護されと共に、電源ラインフィルタを構成するコイルが両トランジスタの中間に位置するわけではないため、電源ラインフィルタを構成するコイルは電源ラインの任意の位置に実装できることになって、トランジスタの出力ラインを延ばす必要はなくなり、不要輻射などの悪影響が無くなる

という効果がある。

【0032】以上説明した如く本発明の請求項3の増幅器によれば、第1および第2のコイルが両トランジスタの貫通電流を制限することになって、貫通電流による破損から両トランジスタが保護されると共に、第1および第2のコイルが両トランジスタの中間に位置するわけではないため、第1、第2のコイルは電源ライン、アースラインの任意の位置に実装できることになって、トランジスタの出力ラインを延ばす必要はなくなり、不要輻射などの悪影響が無くなるという効果がある。

【図面の簡単な説明】

【図1】本発明にかかる増幅器の第1実施例の構成を示すブロック図である。

【図2】本発明にかかる増幅器の第2実施例の構成を示す主要部回路図である。

【図3】本発明にかかる増幅器の第3実施例の構成を示す主要部回路図である。

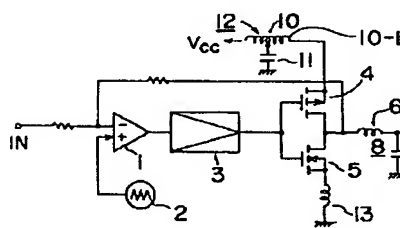
【図4】従来のパルス幅変調増幅器の構成を示すブロック図である。

【図5】正負両電源の場合の電源ラインフィルタの構成を示す回路図である。

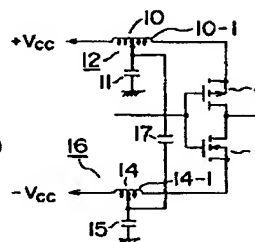
【符号の説明】

- 1 比較器
- 2 三角波発振器
- 3 駆動増幅器
- 4 PチャンネルMOSFET
- 5 NチャンネルMOSFET
- 6、10、14、18および19 コイル
- 7、11、15および17 コンデンサ
- 12および16 電源ラインフィルタ

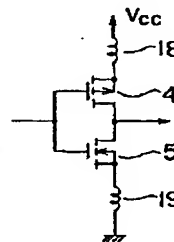
【図1】



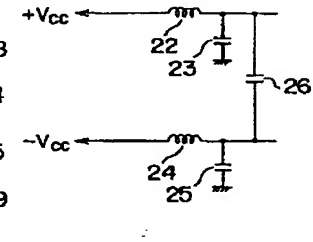
【図2】



【図3】



【図5】



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CLAIMS

[Claim(s)]

[Claim 1] In the amplifier which equips the output amplification stage with the transistor of complementary push-pull connecting, and drives the aforementioned transistor with the on-off signal based on the level of an input analog signal A middle tap is prepared in the coil which constitutes the power supply line filter which is connected to the transistor by the side of the power supply in the transistor of the aforementioned complementary push-pull connecting, and supplies supply voltage to the transistor by the side of the aforementioned power supply. Amplifier characterized by connecting an inductive element into the line which connects the capacitor which constitutes the aforementioned power supply line filter between the aforementioned middle tap and a ground, and connects the transistor by the side of the ground in the transistor of the aforementioned complementary push-pull connecting to a ground.

[Claim 2] the amplifier which equips the output amplification stage with the transistor of complementary push-pull connecting, and drives the aforementioned transistor with the on-off signal based on the level of an input analog signal -- setting -- the power supply line of each power supply of straight polarity and negative polarity -- each -- **** -- the amplifier characterized by to have the capacitor which is connected, prepares a middle tap in the coil which constitutes the power supply line filter which the aforementioned transistor is alike, respectively and supplies supply voltage, and is connected between this middle tap and a ground

[Claim 3] Amplifier which equips with the transistor of complementary push-pull connecting the output amplification stage characterized by providing the following, and drives the aforementioned transistor with the on-off signal based on the level of an input analog signal. The 1st coil connected between the power supply lines of the transistor by the side of the power supply in the aforementioned transistor, and the transistor by the side of this power supply. The 2nd coil connected between the ground lines of the transistor by the side of the ground in the aforementioned transistor, and the transistor by the side of this ground.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] about the amplifier which can be used for PDM amplifier, pulse-number-modulation amplifier, etc., this invention equips a detail with the transistor of complementary push-pull connecting further at an output stage, and is alike and relates to the amplifier which drives this transistor with the on-off signal based on an input analog signal

[0002]

[Description of the Prior Art] It is efficient and for example, PDM amplifier is known as amplifier which can be miniaturized. The conventional pulse width amplifier makes a subcarrier the oscillation output of triangular-wave VCO 2, as shown in drawing 4. In a comparator 1, level

comparison of the level of an analog signal and the level of a subcarrier which were supplied to the input terminal IN is carried out. Supply and amplify the output of a comparator 1 to the drive amplifier 3, and power amplification of P channel MOSFET4 and N channel MOSFET5 as an output amplifier in which complementary push-pull connecting was carried out by the output of the drive amplifier 3 is driven and carried out. It is constituted so that the carrier component under power amplification output may be removed and a load 9 may be supplied by the low pass filter 8 which consists of a coil 6 and a capacitor 7.

[0003] On the other hand, if timing from which the output amplifier by which complementary push-pull connecting was carried out in the above-mentioned conventional PDM amplifier is turned on simultaneously arises, the problem that an output amplifier will be destroyed will arise as well as the decline in efficiency. This will be produced, if it is not steep or a difference is in the time taken for each output amplifier to which complementary push-pull connecting of the standup wave of the driving signal of the output amplifier by which complementary push-pull connecting was carried out was carried out, for example to carry out reversal operation.

[0004] For this reason, as shown in drawing 4, reducing the current which penetrates [the drain of P channel MOSFET4 of a complementary connection] a coil 20 to both MOSFETs 4 and 5 in series even if it connects a coil 21 in series to the drain of N channel MOSFET5, respectively and P channel MOSFET4 and N channel MOSFET5 are turned on simultaneously is performed.

[0005]

[Problem(s) to be Solved by the Invention] However, the output amplification stage is equipped with the transistor of complementary push-pull connecting like the above-mentioned PDM amplifier. In the amplifier which drives the aforementioned transistor with the on-off signal based on the level of an input analog signal Two coils for penetration current limiting will be used, and since each coil other than the trouble that a requisite space becomes large on the occasion of mounting to a printed circuit board etc. is located in the middle of both the output amplifier, you have to mount in the position immediately near an output amplifier. therefore, the pattern of an output line -- not extending -- it does not obtain, consequently the trouble that spurious radiation arises is also produced

[0006] this invention aims at offering the amplifier which prepared the circuit for [of an output amplifier] carrying out penetration current limiting so that it may not become disadvantageous on mounting.

[0007]

[Means for Solving the Problem] In the amplifier which the amplifier of the claim 1 of this invention equips the output amplification stage with the transistor of complementary push-pull connecting, and drives the aforementioned transistor with the on-off signal based on the level of an input analog signal A middle tap is prepared in the coil which constitutes the power supply line filter which is connected to the transistor by the side of the power supply in the transistor of the aforementioned complementary push-pull connecting, and supplies supply voltage to the transistor by the side of the aforementioned power supply. It is characterized by connecting an inductive element into the line which connects the capacitor which constitutes the aforementioned power supply line filter between the aforementioned middle tap and a ground, and connects the transistor by the side of the ground in the transistor of the aforementioned complementary push-pull connecting to a ground.

[0008] the amplifier which the amplifier of the claim 2 of this invention equips the output amplification stage with the transistor of complementary push-pull connecting, and drives the aforementioned transistor with the on-off signal based on the level of an input analog signal -- setting -- the power supply line of each power supply of straight polarity and negative polarity -- each -- **** -- it is characterized by to have the capacitor which is connected, prepares a middle tap in the coil which constitutes the power supply line filter which the aforementioned transistor is alike, respectively and supplies supply voltage, and is connected between this middle tap

[0009] In the amplifier which the amplifier of the claim 3 of this invention equips the output

amplification stage with the transistor of complementary push-pull connecting, and drives the aforementioned transistor with the on-off signal based on the level of an input analog signal. The 1st coil connected between the power supply lines of the transistor by the side of the power supply in the aforementioned transistor, and the transistor by the side of this power supply. It is characterized by having the 2nd coil connected between the ground lines of the transistor by the side of the ground in the aforementioned transistor, and the transistor by the side of this ground.

[0010]

[Function] As for the amplifier of the claim 1 of this invention, the inductive element with which the coil which constitutes the power supply line filter which supplies supply voltage connected the transistor by the side of a ground to the transistor by the side of a power supply into the line linked to a ground again will restrict the penetration current of both transistors, and both transistors are protected from breakage by penetration current. Furthermore, since the coil and inductive element which constitute a power supply line filter are not necessarily located in the middle of both transistors, the coil and inductive element which constitute a power supply line filter can be mounted in the arbitrary positions of a power supply line and an earth line, it becomes unnecessary to extend the output line of a transistor, and bad influences of them, such as spurious radiation, are lost.

[0011] As for the amplifier of the claim 2 of this invention, the coil which constitutes the power supply line filter which supplies supply voltage will restrict the penetration current of both transistors to the transistor by the side of a power supply and a ground, and both transistors are protected from breakage by penetration current. Furthermore, since the coil which constitutes a power supply line filter is not necessarily located in the middle of both transistors, the coil which constitutes a power supply line filter can be mounted in the arbitrary positions of a power supply line, it becomes unnecessary to extend the output line of a transistor, and bad influences of it, such as spurious radiation, are lost.

[0012] As for the amplifier of the claim 3 of this invention, the 1st and 2nd coils will restrict the penetration current of both transistors, and both transistors are protected from breakage by penetration current. Furthermore, since the 1st and 2nd coils are not necessarily located in the middle of both transistors, the 1st and the 2nd coil can be mounted in the arbitrary positions of a power supply line and an earth line, it becomes unnecessary to extend the output line of a transistor, and bad influences of them, such as spurious radiation, are lost.

[0013]

[Example] Hereafter, an example explains this invention. Drawing 1 is the block diagram showing the composition of the 1st example of the amplifier concerning this invention, and has illustrated the case of PDM amplifier.

[0014] The amplifier of the 1st example is an example at the time of using straight polarity voltage, the supply voltage V_{cc} of straight polarity is supplied to the source of P channel MOSFET4 which is a transistor by the side of the power supply of the transistor by which complementary push-pull connecting was carried out, and the source of N channel MOSFET5 which is a transistor by the side of the ground of the transistor by which complementary push-pull connecting was carried out grounds it to it. In the amplifier of the 1st example, a comparator 1, triangular-wave VCO 2, the drive amplifier 3, MOSFETs 4 and 5, a coil 6, a capacitor 7, a low pass filter 8, and a load 9 show the portion of the same agreement of the conventional example shown in drawing 4, and omit these explanation.

[0015] In the amplifier of the 1st example, in order to remove the noise on which the source of P channel MOSFET4 was overlapped at the power supply line, it has connected in series and the power supply line filter 12 which consists of a coil 10 and a capacitor 11 supplies supply voltage V_{cc} to the source of P channel MOSFET4 through the power supply line filter 12. The middle tap is prepared in the coil 10 and the power supply line filter 12 has grounded the middle tap of a coil 10 through the capacitor 11. Furthermore, the coil 13 is connected to the source of N channel MOSFET5 in series, and the source of N channel MOSFET5 is grounded through the coil 13.

[0016] According to the amplifier of the 1st example constituted as mentioned above, the supply voltage from which the noise of a power supply line was removed by the power supply line filter 12, and the noise was removed is impressed to the source of P channel MOSFET4. Furthermore, when both P channel MOSFET4 and N channel MOSFET5 are turned on, the current which penetrates P channel MOSFET4 and N channel MOSFET5, and flows with the impedance of coils 10 and 13 is restricted, and P channel MOSFET4 and N channel MOSFET5 are protected from destruction, and decline in efficiency is prevented. Furthermore, in this case, the P channel source side of MOSFET4 will reach coil 10-1 from the middle tap of a coil 10, and the short energization style by electric discharge of the charge of a capacitor 11 will be restricted by the impedance of 13.

[0017] Moreover, in amplifier, since the power supply line filter usually connected is used when the power supply line filter is usually connected and it is usually based on the amplifier of the 1st example, there is no place which becomes disadvantageous on mounting by the power supply line filter 12. Although it is the coil 13 which the need of newly connecting produces, since it connects with the source of N channel MOSFET5 between grounds in series, a coil 13 can be mounted in arbitrary positions and the place which becomes a mounting top problem does not have it.

[0018] Below, about the 2nd example of this invention, drawing 2 which explains is the circuit diagram showing the composition of the amplifier of the 2nd example concerning this invention, and only the principal part is shown in drawing 2.

[0019] The 2nd example is supply voltage in the source of N channel MOSFET5 which is a transistor by the side of the negative supply of the transistor by which supplied supply voltage +Vcc to the source of P channel MOSFET4 which is an example in the case of using two voltage of the positive/negative of straight polarity voltage and negative polarity voltage, and is a transistor by the side of the positive supply of the transistor by which complementary push-pull connecting was carried out, and complementary push-pull connecting was carried out to it. - Vcc is supplied. In addition, although it is the same as that of the case of a comparator 1, triangular-wave VCO 2, the drive amplifier 3, P channel MOSFET4 as an output amplifier and N channel MOSFET5, the conventional example described above about the low pass filter 8, and the 1st example, it has omitted.

[0020] In order to remove the noise of a power supply line in the source of P channel MOSFET4, it has connected in series and the power supply line filter 12 which consists of a coil 10 and a capacitor 11 supplies supply voltage +Vcc to the source of P channel MOSFET4 through the power supply line filter 12. The middle tap is prepared in the coil 10 of the power supply line filter 12, and the middle tap of a coil 10 is grounded through the capacitor 11.

[0021] Furthermore, the power supply line filter 16 which consists of a coil 14 and a capacitor 15 in order to remove the noise of a power supply line in the source of N channel MOSFET5 is connected in series, and it lets the power supply line filter 16 pass, and is supply voltage. - Vcc is supplied to the source of N channel MOSFET5. The middle tap is prepared in the coil 14 of the power supply line filter 16, and the middle tap of a coil 14 is connected to the middle tap of a coil 10 through the capacitor 15 while grounding it directly. Moreover, it has connected by the capacitor 17 between the middle taps of coils 10 and 14.

[0022] Here, the power supply line filters 12 and 14 are normal mode filters, and the capacitor 17 constitutes the common mode filter.

[0023] In the amplifier of the 2nd example constituted as mentioned above, the operation of the power supply line filter 12 is the same as that of the case of the 1st example. While the noise of a negative polarity power supply line was removed by the power supply line filter 16, when both P channel MOSFET4 and N channel MOSFET5 are turned on, the current which penetrates P channel MOSFET4 and N channel MOSFET5, and flows with the impedance of coils 10 and 14 is restricted, and P channel MOSFET4 and N channel MOSFET5 are protected from destruction, and decline in efficiency is prevented.

[0024] As [show / usually / moreover, / the amplifier using straight polarity voltage and negative

polarity voltage / in drawing 5] The filter which consists of a coil 22 which constitutes the filter in normal mode, and a capacitor 23, and the filter which consists of a coil 24 and a capacitor 25, When the power supply line filter which consists of a filter in the common mode which furthermore consists of a capacitor 26 is usually connected and it is based on the amplifier of the 2nd example of this invention Usually, since the power supply line filter shown in drawing 5 connected is used, there is no place which becomes disadvantageous on mounting by the power supply line filters 12 and 16. It is because there is nothing that the need of newly connecting produces.

[0025] The 3rd example of this invention is explained below. Drawing 3 is the circuit diagram showing the composition of the 3rd example of this invention, and only the principal part is shown in drawing 3 .

[0026] The 3rd example of this invention is an example in the case of using straight polarity voltage like the 1st example of the above. A coil 18 is connected to the source of P channel MOSFET4 which is a transistor by the side of the power supply of the transistor by which complementary push-pull connecting was carried out in series. Supply voltage +Vcc of straight polarity is supplied to the source of P channel MOSFET4 through a coil 18. A coil 19 is connected to the source of N channel MOSFET5 which is a transistor by the side of the ground of the transistor by which complementary push-pull connecting was carried out in series, and the source of N channel MOSFET5 is grounded through the coil 19. In addition, although it is the same as that of the case of a comparator 1, triangular-wave VCO 2, the drive amplifier 3, P channel MOSFET4 as an output amplifier and N channel MOSFET5, the conventional example described above about the low pass filter 8, and the 1st example, it has omitted.

[0027] When P channel MOSFET4 and N channel MOSFET5 are turned on, the current which penetrates P channel MOSFET4 and N channel MOSFET5, and flows with coils 18 and 19 is restricted, and P channel MOSFET4 and N channel MOSFET5 are protected from destruction, and decline in efficiency is prevented [in / the 3rd example constituted as mentioned above / both]. Moreover, although coils 18 and 19 are needed according to the 3rd example, things can be carried out, a coil 18 can mount a coil 19 in the arbitrary positions of an earth line mounted in the arbitrary positions of a power supply line, and restrictions do not have it and it becomes advantageous on mounting.

[0028] In addition, although the case where an output amplifier was MOSFET was illustrated in the 1st or 3rd above-mentioned example, even if it is a bipolar transistor, it can constitute similarly.

[0029] Although the example of PDM amplifier explained in the above, it can constitute from a case of the pulse-number-modulation amplifier of form that the pulse density around the unit time of a pulse carrier is modulated by the level of an input analog signal, similarly.

[0030]

[Effect of the Invention] The coil which constitutes the power supply line filter which supplies supply voltage to the transistor by the side of a power supply according to the amplifier of the claim 1 of this invention as explained above Moreover, while the inductive element which connected the transistor by the side of a ground into the line linked to a ground will restrict the penetration current of both transistors and both transistors are protected from breakage by penetration current Since the coil and inductive element which constitute a power supply line filter are not necessarily located in the middle of both transistors, The coil and inductive element which constitute a power supply line filter can be mounted in the arbitrary positions of a power supply line and an earth line, and it becomes unnecessary to extend the output line of a transistor, and they are effective in bad influences, such as spurious radiation, being lost.

[0031] As explained above, according to the amplifier of the claim 2 of this invention, the coil which constitutes the power supply line filter which supplies supply voltage will restrict the penetration current of both transistors to the transistor by the side of a power supply and a ground. Since the coil with which both transistors constitute a power supply line filter from

breakage by penetration current with protection **** is not necessarily located in the middle of both transistors, The coil which constitutes a power supply line filter can be mounted in the arbitrary positions of a power supply line, and it becomes unnecessary to extend the output line of a transistor, and it is effective in bad influences, such as spurious radiation, being lost.
[0032] As explained above, while the 1st and 2nd coils will restrict the penetration current of both transistors and both transistors are protected from breakage by penetration current, according to the amplifier of the claim 3 of this invention Since the 1st and 2nd coils are not necessarily located in the middle of both transistors, The 1st and the 2nd coil can be mounted in the arbitrary positions of a power supply line and an earth line, and it becomes unnecessary to extend the output line of a transistor, and they are effective in bad influences, such as spurious radiation, being lost.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the composition of the 1st example of the amplifier concerning this invention.

[Drawing 2] It is the principal part circuit diagram showing the composition of the 2nd example of the amplifier concerning this invention.

[Drawing 3] It is the principal part circuit diagram showing the composition of the 3rd example of the amplifier concerning this invention.

[Drawing 4] It is the block diagram showing the composition of the conventional PDM amplifier.

[Drawing 5] It is the circuit diagram showing the composition of the power supply line filter in the case of positive/negative both power supplies.

[Description of Notations]

1 Comparator

2 Triangular-Wave VCO

3 Drive Amplifier

4 P Channel MOSFET

5 N Channel MOSFET

6, 10, 14, 18, and 19 Coil

7, 11, 15, and 17 Capacitor

12 and 16 Power supply line filter